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Ferroelectric Behavior of $NH_4Fe(SO_4)_2 \cdot 12H_2O$.* F. Jona, K. Vedam, T. Mitsui and R. Pepinsky, The Pennsylvania State University.

A dielectric anomaly occurs in ammonium iron alum at low temperatures[1]. A re-investigation of this crystal has been carried out.

The dielectric constant is about 6 at room temperature, and rises to a sharp peak, of approximately 60, at -185°C. A large ac field applied along the cubic [100] direction causes the appearance of double hysteresis loops above and close to the transition point, indicative of a first-order ferroelectric transition, as observed in the case of $BaTiO_3$[2]. In a 60 cps electric field of 20 KV/cm, the double loops can be observed within a range of about 2°C above the transition temperature. Ferroelectric loops appear at and below the Curie point, but can only be observed in a temperature range 1 to 2° below the transition. The spontaneous polarization P_s is of the order of 0.3 microcoulomb/cm^2, and the coercive field about 20 KV/cm. At about 2° below the Curie point, the hysteresis loop collapses suddenly to a narrow ellipse. This indicates that the motion of the domain walls is hindered and the coercive field is far larger than the breakdown field.

The behavior of the crystal under a strong ac field applied along the cubic [111] direction is interesting. In this case the crystal acts if the transition were of the second order.

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[1] R. Guillien, Compt. Rend. 209, 21 (1939).

[2] W. J. Merz, Phys. Rev. 91, 513 (1953).